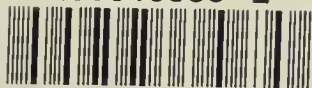


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THE NEW MATERIALISM.

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ITS

NATURE, AND ORIGIN.

BY

LIONEL S. BEALE, M.D. F.R.S.

Professor of Pathological Anatomy, King's College, London, etc.

LONDON :

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THE inquiry whether the hypotheses upon which modern scientific opinion in favour of some form of the physical doctrine of life which constitute the basis of every kind of materialism are or not worthy of acceptance at this time, has called forth very different replies. Some in authority have answered with the positive and unhesitating affirmative, others have given an uncertain assent, or have contented themselves by not dissenting. A very small number have objected to the physical view of life as untenable in the present state of scientific knowledge, and as being, upon various grounds, unworthy of acceptance. In this minority I still find myself, because, notwithstanding full inquiry, and very careful examination

concerning conclusions arrived at by others, I am obliged to confess that I feel more strongly convinced than ever, that all the physical doctrines of life yet advanced are quite untenable. Some of the reasons which have led me to draw this conclusion shall be set forth in this paper, while many more have been already given in words and memoirs which have been written by me during the last twenty years. The general conclusion which, as it seems to me, a careful and candid examination of the facts which bear upon the question compels an unbiassed thinker to draw, is that no form of the hypothesis which attributes the phenomena of the living world to mere matter and its properties has been, or can be, justified by reason.

Unlearned people have been flattered by having been, as it were, taken into the confidence of certain authorities of materialistic tendencies, and assured that, as science is but educated common-sense, they are well able to judge concerning many deep, scientific questions of consummate interest to every person of intelligence, and that, therefore, they will feel convinced of the truth of recent conjectures on the physical nature of life. Materialistic doctrines have now been taught for so many years that they have come to be looked upon as a sort of belief, or faith, which ought to be at once accepted by all who desire to be considered, from the materialistic point of view, as reasonable persons. Any who should be so rash as to inquire concerning the exact meaning of the terms employed, would be, of course, altogether beneath notice, as they would prove, by the doubt they implied, that they belonged to that large group of unteachable persons not included among the wise, the learned, or the cultured.

Instead of the hypothetical suggestions in favour of the physical doctrine of life, advocated by materialists and others, resulting from a legitimate flight, or extension, of the imagination into the border-land which lies between the extreme limit of observation and experiment, and that region which gradually passes into the Unknown and Unknowable, it will, I think, be found that they are almost entirely sustained by mere assertion, and by authoritative declaration, while careful study will convince that they are not sanctioned by the facts, observations, and reasonings, which constitute the science and philosophy of the time in which we live.

Positive conclusions have been drawn concerning questions of momentous consequence not only to curious and scientific people, but to mankind at large, and have been advocated with a confidence which precludes doubt, and reiterated with a pertinacity, which is calculated almost to enforce acceptance.

But few of those, who are carried along by the materialistic stream, have troubled to think over the remarkable tenets to which they have given their assent. They receive with a faith, called robust, which seems so blind and unreasoning as to border on credulity, dogmatic and dictatorial conjectures of the most extravagant kind, convinced, but not by reason, that the authors of them could not be mistaken in the views they advanced with such positive and undoubting emphasis.

The reception of materialistic dogmas by any intelligent person who takes the trouble to think over their terms, and is capable of appreciating, and analysing, and examining the evidence upon which they are supposed to rest, is simply impossible; and the applause with which these views have been received in some quarters is to be accounted for by the decline of thought, and the indisposition on the part of the public to trouble to think at all on the merits of the arguments presented to them. Is there one acquainted with the powers and actions, and results of living, of any form of living matter, who will declare that he believes the doctrine that non-living matter alone is the source of all life, and will state the grounds of his belief?

Bear in mind that no state of matter known, no mere chemical combinations, no mechanical contrivances, no machinery ever made, can be caused to exhibit phenomena resembling in any really essential particular those which are characteristic of every form of living matter that exists in nature, and which, we must infer, have characterised every particle that has ever existed since the first appearance of primitive life on the earth.

Neither can any known form or mode of ordinary energy construct or form, direct, control, or regulate. Nevertheless, it is taught far and wide that vital actions are due to the energy which belongs to ordinary matter, and that, therefore, vital action is but a modified form of ordinary physical or physico-chemical action. Vital action, it is said, differs in degree only from actions which occur in the non-living world.

As regards the nature of that remarkable process of growth which takes place in all things living we find great diversity of opinion. Some, indeed, maintain that growth is not a vital process at all, but that it essentially consists of the aggregation of particles of matter; nevertheless, no one who regards growth as a physical operation has appealed to any definite case of growth to show that the intimate changes which occur are really of the character he asserts. The growth of a leaf, for example, seems to be very widely removed from the mere aggregation of particles of matter.

In all growth we have a process essential and peculiar to all life, which is confined exclusively to the living, which does not characterise any form of non-living matter whatever. But *growth* is but one of several vital phenomena absent in all non-living, present in every kind of living. It has been asserted, and is now ordinarily taught, that crystals *grow*. Between the so-called growth of a crystal and the actual growth of a particle of living matter there is, however, no true analogy.

Herbert Spencer, strange as it may seem, affirms that crystals *grow*, and that non-crystalline masses of various kinds *grow*. He declares that the accumulation of carbon on the wick of an unsnuffed candle is an example of *growth*. On the other hand, he states that the living shoots from a growing potato are not an example of growth. Now I desire to direct your attention to this part of Herbert Spencer's work because he endeavours to convince his readers of "the essential community of nature between organic growth and inorganic growth." There, will be found some of the very remarkable inferences upon which his system of evolution in part rests, and which may be clearly proved to be erroneous. Indeed, not a few of the assertions he makes may be answered by a direct contradiction, with advantage to the cause of truth. Non-living things do not *grow*, as he affirms, while all living things and every form of living material *does grow*, although, he says, with respect to a living plant that its increase is not *growth*. The case of the potato, which he affirms not to be *growth*, is really as good an instance of growth as can be obtained in nature. Now, if I can persuade any disciple of Herbert Spencer to explain and defend his utterances in the first two pages of this chapter of part II. on the "Inductions of Biology," I think much advantage would result. A careful examination of this chapter will enable any intelligent person to see how the idea of community of nature sought to be established between the living and the non-living is defended by this author. The so-called *growth* of the non-living masses differs absolutely from the only true *growth* which is peculiar to the living world, but universal in it. Now vital growth has never been explained to this day, and cannot be explained on chemical or mechanical principles, or imitated in the laboratory. The *growth* of the most minute particle of living matter is, as I have stated, a vital process, and is due to the operation of a force or power absolutely distinct from ordinary energy and from every form of force of non-living matter. Every kind of aggregation is absolutely distinct from growth, and does not involve the

latter. Processes of aggregation may go on to all eternity without the occurrence of any change resembling, or allied to, that of growth. *Growth* after all is but one of several purely vital phenomena.

Surely it is the duty of all persons having any pretensions to culture, who esteem accuracy and truth, and desire to promote their diffusion, either to condemn the materialistic doctrine as scientifically untenable, or to insist that more accurate and adequate explanation of the facts and principles upon which it is based should be given by those who have unreservedly committed themselves to the universal application of this physical hypothesis of life, and that some reply should be made to the objections that have been raised to its general application to living things.

I would draw attention to the declaration again and again repeated, and now taught even to children, *that the living and the non-living differ only in degree, that the living has been evolved by degrees from the non-living*, and that the latter passes by gradations towards the former state. No one has adduced any evidence in proof of these conclusions which are, in fact, dictatorial assertions only, and no specimen of any kind of matter which is actually passing from the non-living to the living state, or which can be shown to establish any connexion between these absolutely different conditions of matter has been, or can be at this time, brought forward.

You will, I think, find that, in endeavouring to prove the reasonableness and strength of the doctrines they have espoused, the advocates of every form of materialism mainly rely upon the assumed applicability to matter that lives, of conclusions arrived at concerning the nature of the phenomena of non-living matter. But the fact, That this living matter, as is well known, is invariably derived from matter that already lived, is a serious difficulty which presents itself to the mind at the outset of the inquiry, and which, instead of receiving some explanation as regards its bearing upon physical views of life, is on account of its inconvenient tendency generally ignored. Materialism, indeed, rests upon this assumed intimate alliance and relationship between the living and non-living. But as soon as the knowledge of the peculiar and special nature of all vital actions shall be better known and more widely spread, and when people shall have learnt how absolutely the vital are marked off from purely physical and chemical actions, belief in materialism will be shaken, and this antiquated creed will then only retain the support of a few faithful adherents wedded to the old paths and ancient ways who have not heart to desert the old beliefs, evolved in the infancy of thought and

philosophical inquiry. Were their reason allowed to do so, it would probably lead them towards a goal of a very different nature. It is, indeed, strange that one of the chief means relied upon for the purpose of convincing people of the truth of materialism should be to institute comparisons between things which are alive and have gradually grown—from the infinitesimal, transparent, structureless—into form and bulk, and lifeless machines which have been made in pieces and afterwards put together; and to assure the public that these two utterly distinct things, living beings and machines—nay, machines made by man, and not capable of being produced in any other way—were very much alike, and belonged to the same category. It would be tedious were I to repeat the dictatorial utterances in argumentative form which have been published far and wide for the purpose of leading people to believe that a living thing was like a watch, or a steam-engine, or a hydraulic apparatus. Moreover, some of the comparisons have been voluntarily abandoned by their authors in favour of others even more absurd. Such tricks as calling a watch a *creature*, and a man a *machine*, are hardly likely to mislead even the most ignorant after they have withdrawn themselves from the bewitching influence of the persuasive eloquence of the materialist prophet, and have commenced to calmly think over his extraordinary utterances, in order to extract any meaning that may be hidden by the frothy metaphors of modern physico-vital conjecture.

The very last comparison made for the purpose of helping people to understand the nature of a living thing, is, I think you will say, the very worst and most inappropriate ever suggested—one that, as you will perceive, must be rejected, not only because it is quite inapplicable, but because the thing with which a living being is compared is so distorted and so changed that it is no longer what it has been called—nay, in the terms adopted it is not even conceivable by the imagination. This last thing which it has been said a living body is like is called an army, but, as I shall show you, some essential characteristics of an army have been taken away, and some impossible characteristics arbitrarily added, which would reduce a hypothetical army to that which could no longer be correctly termed an army; and as some of the characters super-added are absolute impossibilities of nature, the whole comparison comes to little more than incongruous, unintelligible metaphor, or incoherent rhapsody, which may amuse the fanciful and thoughtless, but which ought to be condemned by all capable of thinking, as extravagant and misleading, and as likely to hasten the decadence of thought.

Let me beg of you not to allow the mind to be diverted by fanciful comparisons and asserted resemblances of the living to the non-living, from the careful consideration of the real differences between that which is alive and that which is not alive. This question of difference or resemblance between vital and physical will be found to underlie some of the most important speculations of our time, and I cannot too earnestly draw your attention to the very great importance of insisting that the facts and arguments advanced by materialists should be clearly stated so that they may be thoroughly sifted, and fairly discussed, instead of vague assertions in favour of wide generalisations being accepted without examination or inquiry. If examined not a few of the conclusions will, I am sure, be dissipated at once, for they will not stand the test of careful analytical exposition.

It is not to the credit of the science, or the philosophy, or even the common-sense of our day, that broad and far-reaching doctrines of the kind alluded to, and which involve inferences of transcendent consequence concerning the present, past, and future of all things, should be accepted without examination, taught far and wide even to babes, and presented in a clever and inviting guise, and made to appear as if they were actual and generally received truths, to be accepted by all who wish to be considered to be progressing with the times, while in reality the doctrines in question are mere conjectural opinions founded on vague and insufficient data, with nothing whatever to recommend them save authoritative assertion. Such doctrines would have little chance were it not for love of extravagant novelty, and the decline of thought.

It must, I think, be admitted that in science, as well as in some other departments of human endeavour, there is at this time far less freedom of thought as well as of discussion than is necessary for intellectual progress. Real advance is in these days too often thwarted by cliques and caucuses whose chief business it seems to be to manufacture "public opinion," to create "tendencies of thought," and thus prevent, or render nugatory, the intelligent examination and criticism of the doctrines established and spread. Besides this, the prejudices of the unlearned are sometimes flattered, and the applause and indolent acquiescence of mere numbers eagerly sought for. Many of those who support materialistic doctrines, are too lazy to think over the principles upon which the doctrines they are persuaded to accept are based, nor are they able to estimate the consequences which the general adoption of such speculations would involve. The exercise of a sort of terrorism has led to people being frightened into a sort of confession

of faith in some absurd dogmas, the threatened penalty for refusal being that of being numbered amongst the fools, the bigots, the orthodox, and the like.

Some who accept fancies of the most conjectural character as new articles of belief, which involve the abandonment of old truths as well as the sacrifice of firm bulwarks of belief, seem to reluctantly yield a regretful, but conscientious submission to the stern dictates of truth, and pose as if they were exercising a self-denying virtue, possibly not unalloyed with pity, nor quite free from contempt for those who still hopefully cling to the beliefs of their fathers. Nevertheless, if you will take the trouble to thoroughly investigate the principles of the new faith, you will be convinced that all that can be obtained by the most careful analytical examination of the foundations upon which different forms of new materialism rest, are dogmas about forces and properties, hypotheses as to what may be, or might be, or must be, and a robust faith, which you are requested to have, in wonderful discoveries which are to be made after the lapse of some time by privileged spirits who, it is asserted, will make their appearance in the future.

That a materialistic and antitheistic view of things may present itself to some minds, and assume what seems to be a reasonable form is, however, possible; but the pretentious vapourings in philosophical phraseology familiar to us, and which are supposed to tend towards that by not a few much-to-be-desired consummation, are often but a poor parody on materialism, and a real disgrace to the critical and reasoning power of our time. Some of the assertions which have been made about the properties and potencies of matter, and which are repeated even in text-books, would not survive candid answers to the questionings of a curious schoolboy.

The popular scientific doctrines of the last few years all seem to admit some vague, imaginary, non-existing first cause, of which neither the nature nor the attributes have been defined, and which is placed at such a remote distance in time from the present era, that in us it can hardly excite more interest than the possibility of a shadowy phantom in an all-pervading primitive mist. There seems to be a fanciful conception of material atoms being evolved from the void; but it is, of course, useless to ask why, when, or how? By one supreme mysterious fiat, or effort, beyond, above, and independent of all law, eternal forces and properties were conferred upon these atoms, I suppose, at the moment of their evolution from the nothing, by virtue of which they restlessly gyrate. The vibrations communicated to atoms by the first impulse then

came under law, and in obedience to laws supposed to have been enacted in the first beginning, still continue their movements, and being acted upon by, and acting upon other atoms, actions of the most complex character are established. Gradually these actions are supposed to take the form of life, and as the ages have rolled on, living forms have assumed a higher character until, at last, the evolution of man himself was consummated. Of all things the farthest removed from the remote cause of his existence, man, the only being in nature longing to know of law, of cause, of consequence, is commanded to see grandeur, and more than grandeur in the fanciful suggestion of a creator of molecules of cosmic vapour out of which earth and air and water, and every form of matter, non-living and living, were, according to the hypothesis, gradually formed, or evolved themselves in obedience to some compulsory arrangement, or not to be accurately defined necessity, or "law," supposed to have been enacted for once and for all by the Creator in the first beginning, and still causing everything and operating on everything up to this very day.

The materialist needlessly, and without reason—or, rather, against reason, as it appears to many—sneers at the want of enlightenment of past generations, and in his own dogmatic and self-confident, infallible way expounds the materialistic views of the existing order of things; extols the tendencies of what he calls the thought of his time, by which he seems to mean materialistic dogma, and prophecies concerning the proofs of the truth of his teachings which are to be discovered by unborn materialistic investigators. His hearers listen with wrapt and unquestioning reverence to his vague and extravagant utterances. They cannot doubt; they dare not think. Have not gifted mechanisms of the highest culture spoken? have not privileged spirits of transcendent power prophesied? Who, then, fit to survive, can doubt—who dares to disparage the glorious grandeur of the universal, ever-moving molecular mechanism?

How often are we enjoined with austere solemnity not to resist the influence of the cold logic of materialistic science? We shall be spurned by many, but we must be encouraged by the conviction that we are acquiring material truth, and sustained by the consolation that, though we may be looked down upon, we may feel certain that we alone are right. We are not only told how we must look at nature, but precisely what we are to see is most accurately described, exactly as it has been discerned by the materialistic intellect and caused to assume a form fit to be received by the people at large. The moving forces and molecular mechanisms have been revealed.

Nature herself has been discovered. And a very pretty nature, indeed, is the materialistic nature which has been embodied by authority, and held up for the contemplation and admiration of mankind. Instead of the benign nature of the Epicurean, which gave to all, which made all, and which provided for all, we have a benighted nature in the shape of a blind, insatiable, relentless, irresistible fate, falsely called law—working like a dull, senseless machine of overwhelming might, maiming, crushing, distorting, destroying, and thus continuing and preserving,—destitute of intelligence and reason,—devoid of justice and mercy. A nature not contributing to the happiness or enjoyment of any, working upon a world peopled with machines and continued by the destruction of the products of ever-recurring, ever-failing, unintelligent, undesigned experiment. A nature whose law is in part worked out by length and strength of tooth and claw ; a nature which must be detested by the good, and despised by all who can think, and see, and reason. Such is the natural world which is held up for our admiration with the consoling assurance of dictatorial authority that it sprang from chaos in obedience to everlasting self-originating (?) law, and that it will return to chaos, in obedience to the same,—all life and work and thought being but the undulations of cosmic nebulosity, and dependent upon the never-ceasing gyrations of infinite, everlasting atoms, as they bound through the ages from void to void.

This, the dullest, the narrowest, the most superficial of all creeds—materialism, which includes some mixture of anti-theism and atheism of various forms and hues—has been half accepted by hundreds of persons during the last few years. I believe all materialistic doctrines, vary as they may in detail, will be found to agree in accepting as a truth—if, indeed, they are not actually based on it—the monstrous assumption that the living and the non-living are one, and that every living thing is just as much a machine as a watch, or a windmill, or a hydraulic apparatus.

According to the material contention, everything owes its existence to the properties of the material particles out of which it is constructed. But is it not strange that it never seems to have occurred to the materialistic devotee that neither the watch, nor the steam-engine, nor the windmill, nor the hydraulic apparatus, nor any other machine known to, or made by, any individual in this world, is dependant for its construction upon the properties of the material particles of the matter out of which its several parts have been constructed? Who would think of asserting that in the properties of brass and

iron or steel we shall find the explanation of the construction of a watch? It has been often affirmed in positive and dictatorial language that the formation of the animal is due to the properties of the particles of which its body is composed.

There can be no doubt that of late years there has been an intense desire on the part of many people to be assured that there was no absolute or essential difference between the changes taking place in living things and in non-living matter, and this idea is supposed to add grandeur to the conception of the unity of universality. The desire has been abundantly gratified. The assertion has been made again and again, and it is being continually repeated and emphasised, but, strange to say, some incredulous sceptics doubt whether, after all, the assertion is literally true. They listen, they admire, they repeat; they even try to persuade themselves and others that the assertion is true, but still they doubt. Many, though they are assured of the analogy between hammered iron giving out heat and the brain, sensation, are not quite convinced. The too frequent repetition of a scientific statement seems to beget doubt in sceptical minds concerning its accuracy. If, as it should do, the doubt excites a determination to carefully examine the foundation upon which the doctrine of the identity of physical and vital phenomena rests, the conviction of the utterly untenable character of the hypothesis will be forced upon the mind of the inquirer, who will afterwards be on the side of the opponents of the faith in the unity of non-living and living.

Many persons of intelligence cannot but admire materialistic unity, and are anxious to be convinced that the non-living and living are really one, and that the phenomena of the living world are due to the properties of matter as much as are those of the non-living world. The simplicity of the idea is convincing. Persons of this persuasion do, in fact, accept materialism in faith, but, above all things, they desire that their doubting faith should be fortified by robust reason. The desire has not been gratified, and, in fact, not a few are troubled by doubt. Those who think over the matter do not wholly believe, though they wish they could believe that they are mere machines. They cannot call to mind any machine which grows as they have grown, while all the machines they know anything about have been made in pieces, which have been put together afterwards.

When people begin to think they will soon see how absurd it is to maintain that growth and the actions going on in living beings are due to the properties of the particles of matter of which their bodies are composed. A little reflection will make

it obvious enough that neither the formation nor the action of the watch, or the steam-engine, or the windmill can be due to the properties of the matter of which the machine is made, but that formation and action depend upon the manner in which the parts are fashioned and put together and made to work. And, of course, the suggestion will occur to those who think that if all these machines were to be destroyed and pounded to pieces, the matter would still retain its material properties, although no one could then discover that it had ever taken the form of a watch, or an engine, or a windmill, any more than a chemist from a thorough examination of the mere matter and its properties would be able to premise that it would one day take the windmill, watch, or other form. But however severely faith in materialism may be shaken by thought, its admirers may take comfort in the consideration that, although to their uninformed intellects much may seem doubtful, uncertain, and strange, the high priests of materialism could unquestionably explain all, and make everything clear, if they deemed it desirable and to the advantage of the millions to do so at this time. The final and complete materialistic revelation is to come in good time.

"Protoplasm" and "Physical basis of Life" have entered into many dictatorial utterances, and the words must by this time be familiar to every one. But if we endeavour to ascertain the exact meaning which is attached to the words, and try to make an accurate estimate of their value with regard to the new light supposed to have been thrown by their use upon the question of the nature of life and the relation of non-living to living matter, we shall find that our task is not an easy one. Protoplasm, it is said, is the physical basis of life. The moving matter in the hair of a nettle, or in a cell of *vallisneria*, the moving matter of the body of an *Amæba* or a white-blood corpuscle, white of egg, boiled white of egg, muscle, roasted and boiled muscle, boiled lobster, are, it has been said, composed of protoplasm and constitute the physical basis of life. Upon the molecular changes taking place in these different forms of matter, life, it has been affirmed, depends, and all of them, it is said, are composed of "molecular mechanisms."

No one can attentively study the statements, and apply his mind to the examination of the assertions which have been made, without observing that the same name, protoplasm, is applied to matter in essentially different states. Living matter is called protoplasm; dead and boiled and roasted matter is also called protoplasm. Living matter, dead matter, and roasted matter are all the physical basis of life. That which is not only dead, but has been dead for a long time, is the

basis of *life*. The matter of a living thing which is alive at the time is also a "*physical basis*." That which is alive is a physical basis of life, and that which is dead is equally a physical basis of life. Such is the reply made to the question, What is the difference between living matter and the same matter which has ceased to live? Such is the method by which it is shown that the difference between the living and the non-living is not a difference in kind, but in degree only. Such is the method by which people have been misled and confused. It is, of course, mere idle trifling of the most transparent character. But few persons have taken the trouble to carefully examine the statements with the object of discovering exactly what was the meaning the author intended to convey. Many, perhaps the majority of readers, are content to catch the words, without troubling themselves to ascertain what meaning ought properly to be attached to them. Perhaps they feel much confused, and not liking even to think disrespectfully of the writer, they persuade themselves that the full consideration of the question is beyond the province as well as the capacity of busy people engaged in the ordinary work of life, and that, therefore, they must accept without inquiry the assertions, as the authoritative utterances of gifted spirits.

Such views would have little chance of being received, or even tolerated, had they not been advanced at a time which was remarkable for the decline of thought, and for the dislike or fear of examining and analysing authoritative statements.

The phrase "undifferentiated protoplasm," as contrasted with "differentiated protoplasm," is now often used. Children are asked questions about it in elementary examinations, and yet no exact meaning has been given by any one to the terms, and the sense in which the words are often used is incorrect. The "differentiation" of protoplasm is one of the cant terms of the time, and is supposed to explain a great deal, while it only deceives and confuses; for instead of differentiation being an explanation of change, or the cause of change, as is implied, it is really only a way of stating a fact. If it is correct to call the undifferentiated matter protoplasm, it cannot be correct to call the differentiated matter by the same name, because the first exhibits phenomena absolutely distinct from any manifested by the last.

Let us endeavour to keep clearly before our minds the paramount importance of the answer given by the science of our time to the question, "What is the difference between living matter and the same matter in the dead state?" If it can

be proved, as declared in many scientific dictatorial utterances, that the difference is molecular, mechanical, or chemical in its nature, then must things living be included in the same category as non-living matter. The living and non-living in that case will truly be one; then would be established the much longed-for Unity; then would materialism rest on an intelligible basis, and constitute the foundation of a popular if not a progressive creed.

But the science of our day has given no answer of the kind. On the contrary, all investigations so far carried out lead to inferences of an opposite tendency. So far from the gradations asserted to exist having been proved, not a vestige of anything tending towards proof has been discovered. No difference in kind so consummate, no divergence in property so wide or so absolute, can be pointed out in nature, as the difference which subsists between a minute particle of matter in the living and the same in the dead state. The difference remains to this day as irreconcilable, inestimable, absolute, in every sense as it ever was; while there is no reason to suppose the difference will be less in time to come.

Now, let me ask you to consider for a moment the movements which affect every form of living matter while it is alive, which cease with its death never to recur, and which are absolutely different from any movements of non-living matter which are known. In many instances so active are these movements that they can be seen and studied under the microscope by any one who chooses to take a little trouble. Although the observer may not be a trained microscopist, he will see enough to satisfy him that the movements are not like those of any ordinary matter. It is true that movement occurs in all kinds of matter non-living as well as living, but the movements of the molecules of non-living matter are one thing, those of living matter another thing altogether. The former belong to matter as matter, and occur in the particles whether alive or dead. The latter continue only as long as life lasts. It has been authoritatively declared that living movements differ from non-living movements in degree only, and not in kind. But any one who studies the movements of living matter soon becomes convinced that they are different in kind from any non-living movements, inasmuch as they begin and cease under circumstances which would not affect the movements of non-living matter, while the very matter which exhibits the living movements will exhibit non-living movements after it has ceased to live. The materialistic doctrine of life, instead of resting upon facts of observation and experiment, rests upon assumptions of the most extravagant

kind, and the facts of nature are too often distorted and made to bend to the requirements of artificial and ridiculous creeds resting on authority only.

Thoughtful persons must be surprised that the constant repetition, without any attempt at proof, of such assertions as, that all living things are mechanisms, mere machines, and that in the living matter of their bodies there is molecular machinery—does not of itself lead to the exposure of the extreme weakness of the materialistic view. For is it reasonable to suppose that the ardent advocates of materialistic doctrine would be content with vain repetitions if they could explain and illustrate their assertions so as to make them intelligible? Would they not offer remarks concerning the *sort* of machinery they say exists? Would they not tell us how it appeared, something about its structure, the way in which it was put together, the mode in which it was dissolved and renovated, the means by which it was made to act? Would they not have something to suggest concerning the forces or powers by which the working of the machinery was directed, and the probable source of these, as well as their ultimate fate? Would they not, if they could have done so, have given diagrams of the molecular machinery of their imagination for the instruction and edification of their less learned and weaker brethren? But instead of this, all that men of this persuasion seem able to do is to repeat again and again the same monstrous assertions, That living matter and non-living matter differ only in degree, and that the action of living matter is due to molecular machinery. But besides giving to non-living matter molecular machinery, the capacities and powers which the living alone possesses are sometimes given to the molecules of inorganic matter. Professor Huxley, for example, goes so far as to affirm that these inorganic molecules have the power of “sensitively adjusting themselves.” Indeed, one would not be surprised if it were discovered that certain molecules which had acquired advantages over others, arranged themselves in such positions as would enable them most successfully to jostle weaker molecules and take the places they were the fittest to occupy.

That such vague notions should be accepted by any but a few enthusiasts who knew nothing of the facts would be surprising; but that such very imperfectly considered conclusions should be accepted by many and become really popular, indicates that there is somehow a demand for them—a desire or determination on the part of people to receive them—a longing to believe them, and a conviction that they will be proved to be true—a determination to rely upon mere authoritative

declarations, and to have their thinking done for them instead of thinking for themselves. Such are some of the indications of a decline of thought.

The public are now-a-days assured that the phenomena of the living world are due, not to *life*, but to the molecular constitution of the matter of which the bodies of living things are composed. Ere long, however, people will find that little consolation, or information, is to be gained from the molecular constitutions that may be, and then they will perhaps be content to be brought face to face with the facts as they are, and will see that the conclusion, That matter became endowed with vital power *after, and perhaps very, very long after it had acquired its molecular constitution*, is more in accordance with the facts of nature than the assumption, That all living forms are due to non-living properties, and that no powers whatever have been communicated to matter and no direct metabolic influence exerted, since its first creation.

It is not now easy to get a hearing for arguments in favour of views concerning the nature and action of living things which in any way conflict with what happens to be the current opinion of the time. The educated public has much to answer for as regards the unmeasured support it has for years past given to speculative thought of a most one-sided character, as well as for the tyranny it has permitted and encouraged, and still allows to be exercised towards any who put forward conclusions which happen to be opposed to the fashionable dogmas of the day.

Can applause or great popularity afford any excuse for the unfair way in which many popular authorities have put the question of vital actions in living things before their hearers. The alternative view is almost invariably represented as an absurdity, or a perverse misrepresentation of the facts. The extent to which mere intellectual trickery is carried in these days is marvellous; but so few people think over what is affirmed by teachers very popular at the time, that the most astounding absurdities receive a sort of acquiescence, and long escape the exposure they deserve. Those who differ from materialists are credited with believing in all sorts of nonsense, and are said to stand upon the ancient ways, while, in point of fact, these professors of materialism—in their style, in their method of procedure, in what they teach as new—are truly most antiquated, for they are really trying to make the world go back more than two thousand years, in order that it may gain the inestimable advantage of reverting to a faith compared with which Mahometanism is advanced, indeed.

In his address to the medical congress, Professor Huxley

tells the assembled medical and scientific men that "the simplest particle of that which men in their blindness are pleased to call 'brute matter,' is a vast aggregate of *molecular mechanisms performing complicated movements of immense rapidity and sensitivity (!) adjusting themselves* to every change in the surrounding world. Living matter differs from other matter in degree and not in kind; the microcosm repeats the macrocosm, and one chain of causation connects the nebulous original of suns and planetary systems with the protoplasmic foundation of life and organisation."

Professor Huxley has been continually propounding and putting forward conjectural utterances of the kind during the last twenty years, and it is surely now time that something more substantial should be brought forward in support of the dogmas than conjectural chains of causation. Just think over the paragraph I have read, and try to extract from it any sense it may contain. We are told that "the protoplasmic foundation of life and organisation" is connected with "the nebulous original of suns and planetary systems," by "one chain of causation." Can an individual be found who will undertake to defend or to expound these nebulous utterances? If they amuse, they will certainly delude and mislead an audience. Here is an example of what is considered good for the purpose of advancing scientific education. That talk of this kind should be deemed likely to enlighten the medical profession, or assist in any way to advance medical education, is most extraordinary.

It is not pleasant to have to differ from Professor Huxley, for not only has he a multitude of enthusiastic admirers, but he is himself a master in the use of very robust language, particularly when he deigns to refer to people who do not agree with him. Some who are unable to accept as the exact truth what he affirms to be truth, have been spoken of as bigots, and it is possible that some other epithets may yet be found, to still more decidedly characterise people who are opposed to his doctrines. Only the other day it was said that a truth which, according to Mr. Huxley, had been "trodden under foot, reviled by bigots, and ridiculed by all the world," is "only hated and feared (!) by those who would revile but dare not!" Professor Huxley likes the word "revile." To say that people who differ from you revile you, is, undoubtedly, an ingenious way of getting out of a great difficulty. When you are asked to explain what you mean by some very confident dictatorial utterance, and if you feel that you cannot do so, there is nothing like accusing your opponent of reviling.

Any evolutionist who has a question put to him which it is inconvenient to answer, and which it would be imprudent on his part to discuss, is "reviled." But whatever the consequences, I shall venture to make some remarks on a few of Professor Huxley's recent utterances, even at the risk of being also condemned as a reviler.

What do you think of the attempt to convince people of the similarity or identity or close relationship between non-living matter and living matter, by calling a non-living particle and a living particle a "molecular mechanism," and by further asserting that non-living matter can be resolved into "molecular mechanisms," and that living matter will also be resolved into "molecular mechanisms?" Huxley tells the Medical Congress that matter is an aggregate of "*molecular mechanisms* performing complicated movements of immense rapidity, and *sensitively adjusting themselves* (!) to every change in the surrounding world." But fancy giving to a particle of lead or iron this power of "*sensitively adjusting itself*." Is there any one in the world, besides Professor Huxley, who would apply such language to non-living matter? By giving to the non-living the attributes peculiar to the living, Professor Huxley succeeds, according to his own satisfaction, in breaking down the contrast between living and non-living matter; but will any one else believe that anything of the kind has been done?

Is it not almost a disgrace to the thought of our time that such transparent fallacies and absurd misrepresentations should not only be allowed to pass without comment, but receive the sanction and approval of many scientific men? Again, Professor Huxley tells the Medical Congress that vital actions are "*nothing but* changes of place of particles of matter." What vital action in this world is *nothing but* a change of place in particles of matter? The statement seems not only unsound, but unfair. To say that any vital action is *nothing but* a change of place of material particles is surely absolutely incorrect, for not only are all vital actions much more than this, but physical actions are more. It is obviously the something more than mere change of place that makes the difference between one form or kind of action and another. If there was *nothing but* change of place, it is clear there would be but one action in the universe, instead of infinite variety of action.

Qualities and properties are by materialistic authorities attributed to matter or denied to matter, as may be convenient; but any attempt to explain the difference between a particle of living matter and the same matter when it has ceased to live, is carefully avoided. It is suggested that the

only difference is a difference in the rate or degree of activity of the molecular mechanisms of which matter dead and matter roasted and boiled, living, not living, of every kind and form, and in every state, is composed. The matter which consists of molecular mechanisms includes, of course, simple and compound substances. Iron, oxygen, a particle of roast mutton, and a particle of living matter, are all included in one category. All consist, according to Professor Huxley, of molecular mechanisms; but the molecular mechanisms of some of these things must consist of more elements than those of others, and the mechanisms of the living protoplasm are surely capable of movements of a character totally different from those of the oxygen. Moreover, it is certainly remarkable that the molecular mechanisms of all forms of "protoplasm" should contain the same four elements. By abstracting one or more of these, the molecular mechanisms of protoplasm would be destroyed, and yet molecular mechanisms of some kind or other would remain. Mr. Huxley does not tell us how we are to distinguish the simple molecular mechanisms from compound molecular mechanisms, nor how the molecular mechanisms of a simple substance like lead differ from those of a compound like his protoplasm. It would seem that the molecular mechanisms of lead are, according to this hypothesis, as much alive as the molecular mechanisms of living protoplasm, but that the latter are more active than the former. They differ in degree, but not in kind.

Professor Huxley must surely have formed a rather low estimate of the intelligence and critical power of the medical profession, to expect them to be convinced by him that the only difference between living matter and non-living matter, is a difference of degree. He asserts that there are complicated movements in the matter of which all living and all non-living matter consists. And without one word of explanation as to what he means, he tells an audience, consisting of highly-educated men from every part of the world, that "the microcosm repeats the macrocosm, and that one chain of causation connects the nebulous original of suns and planetary systems with the protoplasmic foundation of life and organisation." Is thought, I would ask, to be silenced by such nebulous nonsense as this? So far from anything like a chain of causation having been shown, not two links of such supposed chain have yet been discovered. But the whole chain of causation which connects nebulous originals of suns and planets with protoplasmic foundations is of so nebulous a nature that it scarcely deserves notice. "The microcosm repeats the macrocosm," says Professor Huxley; but the more

this metaphorical utterance is thought over, the more difficult does it seem to be to get any definite meaning out of it. What particular minute living thing or microcosm is in the least degree like the world, or like the universe? In what respects, for instance, does a monad or an amæba resemble the world? Surely it is time that people of intelligence should really consider what is gained by vague utterances like the above. We have had during the last fifteen or twenty years no end of materialistic suggestions, prophecies, and promises, but little besides incoherence and inaccuracy have as yet been established. One wonders what the representatives of medical science of all nations thought when they were assured that the microcosm repeats the macrocosm, and what meaning was attributed to these words by those who heard them.

The word "like" has been very curiously employed by many physical authorities, and, strange to say, in many assertions to which I could point, "unlike" would be nearer to the exact truth, as, for example, in the following dicta, *unlike* ought to be substituted for *like*:—Man is *like* a machine; man is *like* a monkey; living matter is *like* white of egg; a living thing is *like* a watch, and a windmill, and a hydraulic apparatus; the body is *like* an army. Now, if any one will point out the respects in which these things are alike, I have no doubt some one will be found who will point out in what respects they are unlike, and then the public will be able to decide which of the two words: *like* or *unlike* is more correct.

"Vital phenomena," says Professor Huxley, "*like* (!) all other phenomena of the *physical* (!) world, are resolvable into matter and motion." Here, as in many other cases, Professor Huxley begs the question. The assertion that vital phenomena belong to the physical world is not to be justified by demonstrated facts. No purely physical phenomena are like any purely vital phenomena. How can vital action be of the physical world when it appears and disappears, while the matter with its physical properties still remains? Between the *motion* of the particles of living matter and the *motion* of particles of non-living matter there is all the difference imaginable—an essential, an absolute, an irreconcilable difference. Materialists, of course, assume and assert the contrary; but, instead of wasting time by assertions, why do they not adduce an example of movements occurring in some form of non-living matter exactly resembling those which occur in living matter? Much of our scientific teaching is now intensely and ridiculously dicta-

torial. Instead of persuading people to consider and admire natural phenomena, and to think over the wonders around them, some scientific authorities think to spread their views, by threatening to place all who do not agree with them in a class, in which nobody likes to be included, however large it may be.

Professor Huxley, with that curious partiality for contradictory statements which distinguishes many of his utterances, condemns in one place the idea of an "indivisible unitary archæus dominating from its central seat the parts of the organism," and in another tells us that "the body is a machine of the nature of an army." Every army to be of any use must, of course, be under a head of some kind or other, but Mr. Huxley's army has no general or indivisible unitary archæus of any kind. Each soldier is, I suppose, to govern himself under inexorable laws enacted when everything was in the state of primitive nebulousity. The army of Professor Huxley is, as we shall see, the most marvellous of all nebulous machinery yet discovered by materialists.

Now let us admit for a moment that the body may be compared to a "machine" of the nature of an army. How does the comparison help us to understand the nature of the body? For is not the army actually composed of a number of machines of the very same kind as that body machine which is said to be like it? What, therefore, can be gained by the comparison? Obviously nothing would be gained by telling people who wanted to learn about the nature of a sheep that it was like a flock of sheep. But the body is a machine of the nature of an army, and the microcosm contains the macrocosm, and, therefore, possibly the body, according to Huxleyan logic, contains the army. But I may be wrong, for it is not an *army*, but a *machine of the nature of an army*. We have machines of the nature of a watch, machines of the nature of a windmill, and machines of other natures, but the machine which the body is like, is of the nature of an army. But this last "machine" is essentially different from all the other machines because it is composed of living men while machines in general consist of non-living materials. In short, Professor Huxley uses the word machine just as he uses the word protoplasm in speaking of that which is living as well as of that which is not living!

But Mr. Huxley's "machine of the nature of an army" shall be further examined. It will be found to be very peculiar indeed, whether it is compared with machines or with armies. The army of Professor Huxley would not be recognised as an army by any general, or by any soldier in

existence. This remarkable army has "its losses made good by recruits born in camp." This is an excellent idea for increasing the number of soldiers, and may be recommended to the War Office.

In the body "each cell is a soldier," says Mr. Huxley. If so, I suppose each cell has the power of acting, of displaying intelligence, of obeying the word of command, and carrying out the orders of the general. In a few sentences further on, as well as in many papers he has written, he deprecates this view altogether, and talks about vital actions being "nothing but changes of place of particles of matter," and he looks forward to "the analysis of the living protoplasm itself into a molecular mechanism." The body he regards as "a synthesis of innumerable physiological elements," each of which may be described "as protoplasm susceptible of structural metamorphosis and functional metabolism."

After all our work, all our chemical, physical, and microscopical investigation—after all that has been gained by most minute and careful anatomical investigation carried on for many years, Mr. Huxley comes forward, and in the most public manner possible, tells the world that the body is not like a watch, or a hydraulic apparatus, but an army—but such an army as never has existed and never could exist—an army not to be conceived by the imagination, an army beyond all powers of reasonable conjecture; an army, the fighting power of which would be destroyed not only by the birth of its recruits, but by the necessary phenomena which would precede that interesting event. But, alas, this is not all, for this army of Professor Huxley's, strange to say, is unfit to survive, for does he not tell us that it is certain of defeat in the long run! Professor Huxley's army is not an army at all, but only an imaginary heterogeneous collection of nebulous impossibilities. It is scarcely credible that such suggestions as those I have criticised could be seriously made in the presence of hundreds of representative medical and scientific men from all parts of the world. You will, however, find them on p. 99 of vol. i., of the "Transactions of the International Medical Congress."

And what end is served by such comparisons? Are we taught anything by such incongruous metaphors? In what particular is any living thing like a watch, or a hydraulic apparatus, or an army? There is not one of the ridiculous comparisons which have been made which helps any one to form an accurate notion of the nature of any living thing in existence. Half the utterances of this kind serve but to confuse and lead the mind away from the truth about life and

the phenomena peculiar to living things. That all this loose, rambling talk concerning questions which can only be determined by observation experiment and reason, should be listened to by intelligent persons is but evidence of the decay of thought and the general love of submitting to the dictation of a tyrannical, materialistic coterie, which, being at this time very popular, attempts to arrogantly dominate over sense and reason.

He who studies any living thing in existence at any period of its life, or the smallest portion of any form of living matter, will soon be convinced that it would not be correct to say that it was like anything else in nature, except some other form of living matter. For it will be found that certain phenomena which characterised the particular living particle characterise all living particles of which we have any knowledge or experience. Further investigation will convince an enquirer that vital phenomena are not comparable with any phenomena belonging to non-living matter. They are, in fact, peculiar to living matter. Between purely *vital* and purely *physical* actions not the faintest analogy has been shown to exist. The living world is absolutely distinct from the non-living world and instead of being a necessary outcome of it, is, compared with the antiquity of matter, probably a very recent addition to it—not, of course, an addition of mere transformed or modified matter and energy, but of transcendent power conferred on matter, by which both matter and its forces are controlled, regulated, and arranged according, it may be, to laws, but not the laws of inert matter.

It is not only one or two of the positions assumed by the materialist that are open to doubt or objection. The whole contention is, and has been during the last twenty years, utterly untenable, because facts have been known which completely controvert all materialistic views which have been put forward. Mere popularity, it need scarcely be said, goes for very little, unless the facts and arguments urged in favour of the doctrines can be shown to rest upon evidence. Neither is it a question of much consequence how confident individuals may be who countenance or endorse the hypothesis, That any vital action in nature is due to physical forces only. Nor can concurrence of opinion on the part of even a large society, or a tendency of thought, however marked, be accepted as conclusive. What is required is, that the arguments advanced in favour of this view should bear the test of examination. Instead of this being the case, many of these arguments have been over and over again conclusively shown to be worthless; and a critical examination more

thorough than that to which they have been hitherto submitted will certainly be so much the more demonstrative of their worthlessness. It is utterly unreasonable to assume, as has been continually done, that the laws which govern vital actions are the very same laws as those which all non-living phenomena obey. There is not at this time a shadow of evidence in favour of such a contention. It rests only upon pure assumption, and is one of the most reckless and most unjustifiable of the many untenable assumptions to be met with in the history of thought. It is opposed to facts of common experience and observation, as, for example, the growth upwards of a tree; but this as well as other facts have been explained so as to fall in with the assumption.

It may be freely admitted that if we attribute to vital power certain phenomena of the living world, which have not been, and cannot be, explained or accounted for by any physical laws yet discovered, we thereby assume an agency which we are unable to isolate or demonstrate, and the existence of which we cannot in any way prove. On the other hand, it is only fair to observe that, if we assume that phenomena peculiar to life will some day be explained by physics, we certainly act in a manner which is not sanctioned by science—we assume, we prophesy, and prophetic assumptions of every kind are contrary to the spirit of science. But, if we accept the dicta of many popular teachers, and assert that these vital phenomena are, indeed, physical, we assent to a proposition which has been actually proved untrue, and which has been shown over and over again to have no foundation, in fact, experiment, or observation. Nevertheless, it may be urged that it is no more incorrect or against the spirit of science to assume that a physical explanation will be discovered at a future time, than to assume that the phenomena are due to a force or power which we cannot isolate, and the nature of which cannot be demonstrated. But is it not in accordance with reason to assume the existence of a peculiar power to account for phenomena which are peculiar to living beings, which differ totally from any known physical phenomena, and which cannot be imitated—and is it not contrary to reason to prophesy that such phenomena will one day be explained by ordinary forces or powers? Notwithstanding all the tremendous efforts which have been made by intellects the most robust to persuade themselves and others of the promise and potency of the molecular mechanisms of their imaginations, up to this very moment, nothing which in the least degree justifies their positive assertions has been discovered. Nothing like a vital phenomenon has been explained by physical science or imitated in the laboratory.

The simple truth is that the essential phenomena of all living beings cannot be explained without recourse to some hypothesis of power totally different from any of the known forms or modes of energy. Any one who allows his reason to be influenced by the facts of nature as at present discovered will feel obliged to admit the existence of vital power as distinct from, and capable of controlling, the ordinary forces of non-living matter. It has been conclusively shown that the laws of vital force or power are essentially different from those by which ordinary matter and its forces are governed. My own views on this matter, put forward during the last twenty years, have, of course, been ignored by materialistic prophets; but it is satisfactory to find that now and then the word *vital* is actually used in speaking of phenomena, not to be explained by physics and chemistry, by some scientific men who, nevertheless, support the doctrine that vital is, after all, but a form or mode of the ordinary physical action of non-living matter. The fact is, those who act thus feel the weakness of the cause they advocate, and try to hide their confusion by vagueness and obscurity of expression. Within a very few years, the hypothesis of molecular machinery will probably be forgotten, and the operation of vital power, as distinct from any ordinary force of matter, will be generally admitted and taught.

Purely vital phenomena are manifested by every form of living matter from the highest to the lowest. They are temporarily resident in matter which has been derived from matter in the same state, and when once vital phenomena have ceased they cannot be caused to recur in the same particles. Although it is frequently alleged that there is only a difference of degree between the changes in living matter and those in non-living matter, no one, as I have stated, has been able to support this proposition by facts and arguments, or to adduce one single example of matter in any state which illustrates the asserted gradations of change from the living to non-living, or from the latter condition to living. The more we learn concerning the ordinary properties of matter the less probable does it appear that these properties will ever be found adequate to account for the facts of living. How can any reasonable person expect that the disposition of the materials used in the construction of any apparatus or organism will be adequately accounted for by a demonstration of the properties of the materials themselves? Material atoms in living things are made to take up certain definite relations with respect to one another which no experiment has shown to be due to, or to depend upon, properties associated with the matter. Nor

is it even conceivable that property which is unalterable should determine movements and the formation of structures which change from time to time, and the form and exact character of which last must have been foreseen and prepared for from the very beginning. The act of construction, the arrangement of material particles according to a definite and pre-arranged plan and for a special purpose, can no more be attributed to the properties of the matter in the case of a living being than in the case of a watch.

The advocates of materialistic doctrines do not offer a suggestion as to the precise changes which occur when what they deem to be merely a compound substance containing oxygen, hydrogen, nitrogen, and carbon, and, possibly, one or more other elements, passes from the living to the non-living state. The new materialists stand alone among all the sects known to history in not being able, nay, in not attempting, to establish their views by arguments or to support their doctrines by appealing to facts and reason. They content themselves with authoritative declarations of the most positive and solemn kind, but which, from a scientific and philosophical standpoint will be pronounced by dispassionate critics absurd and contrary to fact, and, therefore, not creditable to science. They command people to believe, and encourage them to have robust faith, but as for evidence in support of their materialistic tenets they have literally none. If people generally were acquainted with the facts revealed by the microscopic examination of living matter, and would allow their minds to be influenced by what they observed they would no more believe in the dicta of the materialist than give their faith to an authority who declared that the earth was flat.

The general acceptance of materialistic doctrines is, in itself an indication how little thought is given by most people in these days to the importance of inquiring into the nature of the evidence upon which far-reaching conclusions they too readily receive are supposed to rest. People have been misled in times past by false teaching, and large numbers have become steeped in ignorance, bigotry, and fanaticism. But I do not believe that the most lamentable instances on record have led to results more disastrous, or more likely to prove injurious to the interests of individuals and possibly to nations than this attempt in our own time to establish the weakest and worst form of materialism ever advanced, is calculated to produce in the future. It is bad enough when numbers of people become converts to a system founded on truth more or less perverted, or misinterpreted, owing to the ignorance or mistaken zeal of its exponents ; but

the evils resulting are evanescent and harmless indeed as compared with those which must result from inculcating a system which professes to be founded on reason, but which really rests upon fictions and arbitrary assertions,—a system in which fact is appealed to, but is not to be found. Look at it how you may, you will not discover the smallest speck of firm ground of truth upon which to build any form of the materialistic doctrine. The phantom of possible molecular mechanisms,—confusion between mere energy and the power by which it is directed, between a machine and its maker, between designing and making in form and order and for a purpose, and the mere purposeless piling of particles of matter one upon another, or their equally purposeless falling down, are a few of the erroneous comparisons frequently made and accepted as if they were compatible with reason, and even trophies of recent scientific conquest.

By materialism it is sought to reduce vital phenomena to mere attractions, repulsions, affinities, and to annihilate the idea of vital power. Materialism can only be sustained by the suppression of truths and by ignoring facts that are known, and by a most fantastic and reprehensible system of using the same word in very different senses, and in applying the same term to things which widely differ from one another and even exhibit opposite qualities. By intellectual devices which are certainly not creditable to intellect, the absolute and irreconcilable difference between the *non-living*, and the *living*, and the *dead* are ignored by some, and denied by others; *difference of degree* is substituted for *absolute difference*, while *identity* is not unfrequently made to do duty for *diversity*, and *like* is used where *not like* would be more correct.

THE LIVING AND THE NON-LIVING.

The following remarks upon this subject were made by Professor LIONEL S. BEALE, F.R.S., during the discussion on Dr. Wallich's paper* "On the Fallacy of the Materialistic Origin of Life," read before the Institute, April 17th, 1882.

I propose to offer a few remarks on the view taken by Professor Huxley and other scientific men, both here and on the Continent, in reference to the very important question of the transition from the non-living to the living.

* As yet, ill-health has prevented this author completing his paper for publication; but it is hoped that it may form part of No. 64 of the *Journal*.
—ED.

I am quite sure we shall agree that this is really the kernel of this most interesting subject. We are constantly told of the gradual passage from the non-living to the living, and the formation of a living thing is often spoken of as if the process were something like the change which takes place in the formation of crystals. Most authorities who support the materialistic hypothesis draw a parallel between the formation of the lowest forms of living matter and crystals. Now, it must occur to every one who has at all considered the subject of crystallisation, that although there may be great difficulty in explaining the exact nature of the process, yet, nevertheless, it is well known that when a certain material is dissolved in fluid under certain circumstances, and the solution becomes concentrated, crystals are formed. Every tyro in chemistry has, probably, performed the experiment with common salt; and every such tyro, after having crystallised common salt, has re-dissolved it, and re-crystallised it again and again; and, if he were to go on crystallising and dissolving to the end of time, he would only produce crystals of the same form and the same chemical composition. Now, let him try to do this with regard to a living organism. The living organism is there. We know that every particle of living matter has come from a pre-existing living particle; but let us endeavour to take ourselves back to the time when there existed only the non-living, the inorganic matter out of which the living had to be formed according to a method as is affirmed somewhat resembling that of crystallisation. The chemical compounds that form the living matter—oxygen, hydrogen, nitrogen, and carbon—are supposed to come together in obedience to certain attractions and affinities which these primitive particles possess, but of which we know very little; but let us suppose a living thing is formed. Let us imagine the particles brought together in the manner supposed, and that a particle of living matter makes its appearance. We examine this particle, and try to ascertain its nature, and for this purpose we try, as we have tried in the case of the crystal, to dissolve it. What is the result? We destroy it; we do not dissolve it. (Hear, hear.) It ceases to be living matter before solution begins. It is no longer what it was before, and we cannot make it so. It has gone; it has ceased to be what it was, and we are not dealing with a living particle, but simply with the material that has resulted from the death of that which was before alive. We cannot re-form it. Once dead, it is incapable of being re-produced. Therefore, it seems to me a most extraordinary thing that some of the greatest authorities in science should pretend to compare the formation of living matter with the formation of crystals. There is not the slightest analogy, nor the faintest possible parallel, no comparison between living things and crystals. There is all the difference in the world between the process of crystallisation and the formation of living particles, which are supposed by Haeckel, and others who adopt his views, to be alike. Whatever may be the marvellous changes that occurred in the first formation of living matter, they cannot resemble in the slightest degree any phenomena with which we are familiar. There are no properties of matter that have as yet been discovered that can give us

the faintest conception of the nature of the changes which must have taken place when the first living thing was formed. With regard to the question of complexity and simplicity, of which a good deal has been said, I will just offer a few remarks, and will then sit down. It seems to me to have been assumed in a most extraordinary way that some forms of living matter are extremely simple and that others are extremely complex. I should like to ask what is the meaning attached to these terms "simplicity" and "complexity," when applied to living matter? Let us take the monera, said to be among the simplest forms of living matter with which we are acquainted. All we can see is clear, colourless, transparent, structureless, semifluid matter. Where is the evidence that the composition of this is more simple than that of the most complex living matter in existence? Take, for example, the highest form of living matter we know—the living matter which forms part of the brain cells of man himself, for I suppose we cannot conceive anything much higher. If we were to assume gradations of complexity and different degrees of superiority, we might go as far as to suggest that at any rate the highest and most complex living matter is to be found in the grey matter constituting the outer part of the human brain. But what is the fact? The matter we find there is no more complex than the living matter of the simplest monad, as far, at least, as we know. If we take this brain matter and examine it, we find that we can resolve it into certain organic substances, closely allied to the albuminous material which Professor Huxley and others call protoplasm, although they are not able to define precisely what they mean by the term. (Hear, hear.) They are unable to tell us in what way protoplasm differs from albumen, and muscle tissue, and a thousand other things. They simply make use of a name almost without a meaning. Well, the highest conceivable form of living matter, as far as we know, closely accords in its composition with the lowest form of living matter; and, as far as regards structure, if we examine that which comes from the highest organism, and that which is concerned in the formation of the lowest, no difference whatever can be distinguished. It is not that one is more complicated, or exhibits a structure different from the other. There is no structure in either. Both are perfectly clear, transparent, and structureless, and yet one is concerned in the performance of certain functions and offices, while the other is concerned in the performance of totally different functions and offices. Are we, then, to believe that the difference in the functions discharged is due merely to the chemical properties of the substances of which the living matter is composed? We cannot do this, because, when we come to analyse the two different kinds of living matter, we find in the material which results from their death the same elements. And, if the elements are not in precisely the same amounts or in the same proportions to one another, the difference which may exist in the composition bears no relation and has no reference that can be discovered, either to the difference in action or to the different structures which may be evolved from the two different forms of living matter. Therefore the terms "simplicity" and "complexity" seem to me to be totally inadmissible, and I venture to think that not one

of those who are in the habit of speaking of simple and complex forms can give a rational explanation of what he means by the phrases he employs. What is generally meant by the simplest form of living matter is that when it attains its highest form of development it is still a simple thing, and what seems to be understood by that of the greatest complexity is, that when it attains its highest degree of development certain marvellous structures are produced; but when we come to look at the living matter itself there is no difference to be discerned by any means of examination yet adopted between the two forms. The living matter, which, at the very earliest period of his development, represents man, is, as far as I know, not distinguishable from the forms of living matter of which the simple bodies Dr. Wallich has so lucidly described to us are made up. And therefore the difference cannot be chemical. Neither can it be called physical, nor mechanical, nor can it be due to difference in machinery or mechanism, for none is to be discovered. The difference is enormous, and it is of a most remarkable kind, but it is not to be explained by any facts in physical science with which we are acquainted. All we know is, that under certain conditions one form of living matter *grows* and produces a certain kind of structure, and that under different conditions certain other forms of living matter *grow* and produce a structure that is totally different. The difference between the two is not in molecular or chemical constitution. They do not remarkably differ in chemical composition, and we may safely say it is impossible thus to explain the difference. That is the whole of the matter; the difference in the results cannot be explained by physics or chemistry, and I do not think it ever will be so explained. The difference is one which can only be spoken of under another term altogether, and this is a word to which many object very strongly. I allude to the word "vital." The difference in question is a vital difference, dependent not on a property which belongs to matter itself as matter, or derived from any properties in connexion with the elements which enter into the composition of the living matter. Whether the generation of living matter was spontaneous or not cannot be proved, but much scientific speculation is built upon the theory of spontaneous generation. However necessary such a theory may be to the doctrine of evolution, there are no scientific facts which can at all warrant the conclusion that non-living matter only, under any conceivable circumstances, can be converted into living matter, or at any previous time has, by any combination, or under any conditions that may have existed, given rise to the formation of anything which possesses, or has possessed, life. (Applause.)

ON THE NEW MATERIALISM.*

By LIONEL S. BEALE, F.R.S.

I propose in as few words as possible to ask those present to consider certain views bearing on the first principles of religion and philosophy which have exercised during recent years and continue to exercise an extraordinary influence upon the opinions held by many persons of intelligence. Acquiescence in the views in question, I think it will be found, involves the acceptance of ideas which are not consistent with one another, of doctrines which are contradictory, and principles which are incompatible or even mutually destructive. To give this fashionable confusion of doubt, denial, assertion, assumption, conjecture, prophecy, any name which has been already adopted by any philosophic or religious sect that has existed in the past, would be unjust, for the conflicting opinions now entertained cannot be formulated, and it is doubtful whether, among those who have consented to adopt them generally and vaguely, any two persons could be found who would agree concerning the elementary propositions on which anything like a philosophy could be established. Neither of the terms Rationalism, Materialism, Agnosticism, is strictly applicable to this most recent and most fanciful of all the creeds ever offered for adoption. To call it Rationalism would not be correct, for it does not rest on reason; indeed, it is neither reasonable nor rational. Materialism would be equally inappropriate, and no disciple of Epicurus would admit that it at all resembled the doctrine to which he had given his adherence. Neither the hypotheses, nor the assertions, nor the prophecies of the materialist of the new, would be recognised or approved by one of the old school. Agnosticism, again, would be a complete misnomer, for the advocates of this new philosophy profess to know all things and to account for all the phenomena of nature. They tell us not only the origin but the end of all. Commencing with cosmic vapour, they trace the evolution of all non-living and living, and discern the further changes which are to progress through a distant future until all again eventuates in cosmic mist. Those who know all this can hardly be denominated Agnostics.

One grand central principle of this new philosophy seems to be the assumption that what is not now capable of proof, but is affirmed to be true by its exponents, will be proved to be true by new discoveries which we are assured will certainly be made at some future time by the scientific investigations of that period,—among which discoveries is to be the proof of the confident assertion now so often repeated, and considered to be a

* Being an Address delivered in July by the Author, and specially revised by him for the Victoria Institute. It is inserted here by reason of its importance.—ED.



cardinal point, that the difference between a living thing and the same thing when it is dead, which difference seems to ordinary comprehension so very remarkable as to deserve to be called absolute and insurmountable, is but a difference in degree. The evidence in support of various conjectures concerning changes in the properties of material particles and alterations in the character and properties of living forms is also supposed to be forthcoming at some future time. Upon the fanciful basis thus constructed out of what may be discovered in the time to come is raised a strange and grotesque superstructure of philosophical speculation, contradiction, and inconsistency, perhaps the most curious ever presented for the acceptance and admiration of mankind. Amid all the vagaries of the intellect are to be noticed the most ardent belief in and superstitious reverence for future hypothetical revelations.

Propositions which from their very nature must depend upon faith are rejected by the disciples of the new philosophy as unworthy of belief because they cannot be proved by observation, or put to the test of experiment, or the facts on which they rest be rendered evident to the sense of touch, sight, or hearing. On the other hand, things that have not been proved by observation, but which are within the limits of observation, which have not been demonstrated, but which would have been susceptible of demonstration had they really existed, are to be believed and at once accepted as literally true, because it has been affirmed by scientific teachers, who cannot possibly err, that all things and all phenomena are unquestionably due to the operation of laws of matter about to be discovered, and because certain views concerning things in general, and living things in particular, have been accepted by the established intellectual authority of the time, from whose decision there is no appeal.

The vague and most unsatisfactory hypotheses which are often accepted and believed in as if they were well-ascertained truths of science would have but little chance of acceptance but for the doubt and confusion of thought concerning fundamental principles of religion and philosophy which now prevail, and which, indeed, may be said to characterise the time in which we live. An incomprehensible yearning after breadth of view and an inexplicable terror of being accused of being bigoted and narrow-minded seem to paralyse the judgment and render some of the most intelligent amongst us infatuated victims of materialistic inspiration. The longing for ever-increasing breadth of view has led to the acceptance and teaching of doctrines which are contradictory and in some instances mutually exclusive. Conclusions which involve the denial of the existence of God are not unfrequently accepted at this time by persons who profess to believe the Christian faith. Incompatible and contradictory principles have been made to appear to harmonise by completely altering the meaning of the words employed, and it is doubtful whether any of the original meaning attached to certain most important words is now left. The word "God" is often used as if its whole meaning was comprised in creative power or first cause; and, as to the word "Christianity," its meaning has been modified in so many ways of late that

it would be most difficult to determine what is included and what excluded. In the time gone by Christian atheism would have been regarded as an absolutely impossible form of belief, but would it be quite impossible now to find persons ready, perhaps unconsciously, to justify the phrase Atheistic Christianity?

Some would have us believe that all things living have resulted from the working and inter-action of the forces belonging to non-living matter only, and expect us to be convinced further that the above view of the conversion of the non-living into the living, in obedience to laws which govern matter only, is not inconsistent with the acceptance of the belief in one creating, designing, omnipresent, omniscient, omnipotent will. It has also been held that a God who only creates the Universe, which he then practically abandons, is equivalent to a living God that governs the world and ordains everything according as He wills,—not only the Maker, but the Preserver of all things. But is there no interval between the idea of a first cause originally creating matter and enacting laws for its subsequent guidance and arrangement, and the idea of an existing, living God who governs the world, to whom men may with reason appeal for counsel and guidance, whom they may obey, and to whom they are indebted for life, and health, and everything? Does first cause comprise all that men imply when they speak of the everlasting living God? Does creative power and law-enaction include all the attributes of the God of man? If so, it is indeed, as has been suggested, a very small matter if by modern discovery the scene of the operation of the first cause is put back in a past somewhat more remote from our era than has been hitherto supposed to be the time of its activity. For in this case we should undoubtedly have, as has been suggested, a first cause to fall back upon, still a creator to acknowledge, a law-maker to reverence. But I would ask in all seriousness whether any form of the evolution hypothesis, which dissevers God from all that follows upon the primal act of creation, is consistent with serious belief in His existence,—in fact, belief in a *living God*? What man could worship, pray to, love, or adore such hypothetical first cause? I beg of you to consider whether this conception of the operation of a once-creating, once law-enacting first cause in a past inconceivably remote is an adequate substitute for the theistic idea which has been held for more than two thousand years. However positively some may affirm that the view objected to is not atheistic, it must be held to be of this nature unless the word is used in a sense which no one who believes in a God could allow. I have myself often begged for information concerning the powers and attributes of the God sanctioned by the evolution hypothesis, but so far in vain. The suggestion that the idea of continuousness, or the exercise of power transmitted through matter from the first beginning, or the continuous extension of working and action of such supposed first cause is equivalent to the idea of omnipotence, omnipresence, omniscience, is surely almost an insult to the understanding. Ought not those who care to acknowledge such newly-invented first cause, and those who foolishly try to

force on themselves and others the acceptance of the proposition that the views impugned are not atheistic, or only in a very slight degree atheistic, to accurately define the powers and attributes of the God they would substitute for the God in whom men have hitherto believed? If this were done, we should be able to judge whether it was possible for men in their senses to acknowledge such a power, to submit themselves to its guidance, to love, honour, and obey it, to worship it, for the God of man demands all this and more. Judging from much that has been said and written upon this subject during the last few years, it is difficult to come to any other conclusion than that the real aim of many who speak and write in favour of the new views is to destroy, and within a measurable period of time, belief in the existence of the Supreme Being, in Providence, and in a living God, and to force those who think at all to endeavour, by the mightiest mental effort of which they are capable, to train and exercise their minds by the contemplation of an everlasting infinite nothing. Instead of the new doctrines being explained in detail, we are assured by patronisers and promoters of this retrograde nonsense that the reasonings of So-and-so, who has, in fact, done what he could to prove there is no God, "are inspired by a reverence which is truly religious," and so on, until every one capable of thinking must feel weary of such mawkish adulation and misrepresentation of fact. Of course, the real question is whether, in such a system as has been proposed, any power deserving the name of God is required or could possibly find a place, and then what powers the Deity permitted to exist possesses. A God without will, without power to arrange, order, design according as he wills, can hardly be worshipped by man. For, can omnipotence restricted in its operation by inexorable laws be omnipotent? Is not the idea of omnipotence and omniscience, testing by experiment the results of infinite constructive power, worthy of a philosophy hereafter to be distinguished, for physical revelations supposed to be about to be made, and its rejection of the theistic idea?

Much confusion has resulted from the acceptance of fallacies concerning the nature of the changes in living matter, and the dictum, not proved nor at this time provable, that the living and the non-living are one, governed by the same laws and due to the same cause. The chasm between the living and the non-living has not been bridged, and it cannot be bridged by idle assertions to the contrary and speculations about cosmic vapour, however desirous the public may be that the operation of bridging should be accomplished. The form of Materialistic doctrine now popular neither accounts for any single operation peculiar to living matter, nor helps us to understand the nature of any one. Nothing whatever, I fear, has been added by physical science to our knowledge of the real nature of the marvellous change which occurs when a material atom passes from the non-living to the living state, and becomes an integral part of the very simplest or lowest living matter in existence. The nature of this change, which is unquestionably different in its essential nature from any known physical change, has not yet been elucidated, though it has been over and over again declared that it is

physical. In spite of all the confident utterances, no one has been able to explain, in terms known to physical science, any one of the phenomena occurring during any moment of the existence of the simplest living form in nature. The pretended physical explanations of growth, of the taking up of non-living matter and its conversion into living matter, the formation of structures, of organs, of parts made for a purpose, are utterly inadequate, while some are puerile, and would be dissipated by five minutes' careful consideration on the part of any one who has the requisite knowledge of the facts, as far as they are now known. Many of the statements about life and living matter will not stand the criticism of an intelligent critic, who, though knowing little or nothing of science, will take the trouble to find out the meaning of the words and the sense in which they are used, in order that he may detect cases in which words are inappropriate, and instances in which the same word is used in very different senses perhaps in the same page, as, for example, occurs in the use of the word "Protoplasm," which does duty for living matter, as well as for matter in the opposite or non-living state. If we could trace the atoms of matter through all their changes, until at last they lived, we should understand the nature of life, we should be able to lay down the laws by which vital phenomena are governed, we should understand the changes in our own bodies, we should know ourselves as well as the matter of which our bodies are composed. But in this case we should have spanned the infinite, solved all problems, explained all the mysteries, overcome the theistic idea, and man would have become a different being, and would find himself in a new position in nature.

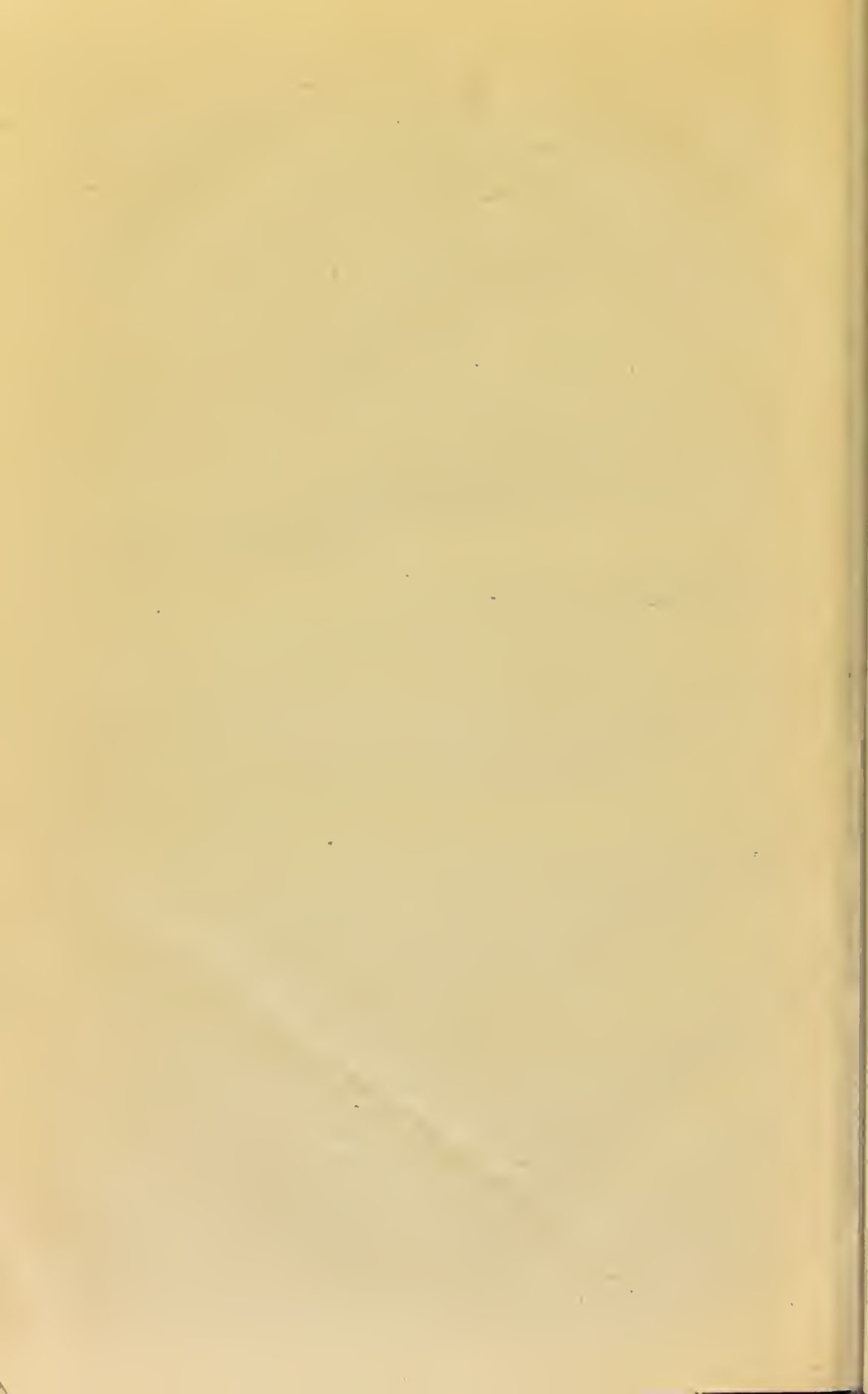
But the changes which take place in the atoms as they flit from non-living to living are still unknown, and the probability of our ever knowing their real nature becomes less as knowledge advances. Man, notwithstanding all scientific discovery and material progress, at least, as far as regards his relation to and knowledge of the Infinite, stands much as he did in the early days of intellectual evolution. Here, then, is the immeasurable difference between the view entertained by us and that held by those who accept or incline towards the fashionable philosophy of the period. We who believe in the irreconcilable differences between living and non-living have been led to conclude that a knowledge of the real nature of the change, as well as a knowledge of the power by which the change is wrought whenever a lifeless atom becomes an integral part of living matter, is not to be obtained. On the other hand, the supporters of the new philosophy declare that all this and much more has been gained, and that much of what yet remains imperfectly understood will be brought to light by the advancing science of the future. We hold that such knowledge is not even conceivable in thought—not cognisable by the human intellect. They declare that the discovery of the nature of the vital change is nigh—nay, that in some respects it may be said that already it has been achieved. We do not admit that the road to such a goal has been found out or the method of proceeding which will be successful suggested. They assure the world that wonderful

things, not to be seen by ordinary mortals, have been discerned by privileged spirits. We believe neither in the powers of discernment claimed, nor in the being privileged, nor in the spirits. The whole position assumed by those who attempt to explain vital actions by physics and chemistry is untenable, and the pretentious assumption of knowledge as to what is to be revealed by the science of the future degrading to the thought of our time. The non-living state of matter is separated from the living state by a chasm which is unfathomable and which has not been, and which never can be, bridged, even in thought. The attempts which have been made to persuade ignorant people to believe that this has been done, or that it is within the bounds of that which is possible, are unjustifiable and antagonistic to the scientific method, and must certainly retard real progress.

The advocates of Atheism, or of that very nebulous form of Theism which logically leads to it, and is, indeed, practically Atheism, have utterly misled themselves and others by assuming the truth of the conjecture that the non-living and living are one, that matter in the non-living state differs in degree only from matter in the living state. They affirm in the most positive and reckless manner that this conjecture is a fact. Unlearned, unscientific people, believing that men of scientific authority would not have spoken thus positively unless they had distinct and irrefragable proof of the statements they made, proceed straightway to modify all the views which they had been taught in their childhood, abandon as fiction what they believed to be truth, and accept as realities the extravagant and fanciful doctrines of that scientific imagination which change from year to year, and concerning which there is but one thing certain,—that they proceed from and will return to the nebulous state. People hungering for a reputation for comprehensiveness, large-mindedness, and intellectual grasp, abandon their belief in the unseen without even being at the trouble of inquiring whether any evidence or argument can be adduced in favour of the new dicta. The sort of argument which seems to convince people, of course longing to be convinced, is to be found in assertions of the vaguest character about the nebulous originals of suns and planets being connected by a chain of causation with the physical basis of existing life and organisation. Can it be supposed that it is in any sense a valid excuse on the part of any thinking person to urge that the responsibility rests with those who teach these doctrines? The desire for being taught encourages the teachers, and if there was no longing for the doctrines of a silly form of science the supply would soon cease. It is surely as much the duty of intelligent persons to find out and expose erroneous teaching in science as in other departments of human knowledge. If but a very little trouble had been taken by some of those well qualified for the task, a good deal of nonsense which has excited curiosity, pleased the fancy, and deceived the intellect during the last twenty years, would have done no more harm than contribute a little intellectual amusement and help to sharpen the wits of the rising generation. Every person of intelligence ought to be competent to estimate the importance and reliability of reasons given for changing or subverting his belief in the fundamental facts of his religion, and most

would certainly, with far less trouble than they take to enable them to decide concerning questions of far less consequence, succeed in doing so. If, for instance, it is said that a living thing grows like a crystal, surely before the dictum is accepted by any one he would naturally inquire whether the new matter taken up by the living thing was deposited particle by particle upon the surface as in the crystal. Doubt would at once be excited in his mind, for no instance would occur to him in which during growth new matter was superposed upon that which was already there, in the case of a living thing. The nourishment always goes into the inside of a living thing, and is never deposited on its outside, as is the case in the crystal when it increases in size. Would it not also occur to him that the matter of the crystal can be dissolved and crystals formed again and again from the solution, while no living thing can be dissolved at all, much less re-crystallised? Such simple considerations would cause doubt to rise in his mind whether a living thing does grow like a crystal, and the doubt would suggest the expediency of further inquiry. He would require, before he accepted the new doctrines, that the particular points in which the so-called crystal-growth resembled and differed from living-growth should be clearly stated. So far from assenting to the proposition that the growth of a crystal was like the growth of a living thing, he would find that the increase in size of a crystal was not growth at all. So, too, with regard to the likeness said to exist between the living and non-living, the particular living and non-living between which this likeness is supposed to exist, should be pointed out. It is probable that the acceptance of many of the most absurd and unreasonable dogmas is due not so much to a want of power to think as to an indisposition to think, and no doubt acquiescence is promoted by a fear of the consequences likely to follow the rejection of, or any opposition to, the said doctrines. He who doubts or opposes is to be numbered with the fools. Nevertheless, I beg of you to consider what you would think of a person who assured you that a watch differed from the iron and brass of which it is made only in degree, and I leave it to you to determine what you ought to think of a philosopher who tries to make you believe that a living thing differs from the non-living matter of which its body consists in degree only. If at this time you press for reasons in favour of the conjectural unity of the living and non-living, all you will get will be some dictum about primitive nebulousity and chains of causation. Anything like criticism is so disliked by the new Materialist, that he condemns those who differ from him by anticipation, and thus for a time criticism is deferred, and his conjectures and fancies may find favour; but that people should be led away so far as to renounce their belief in any form of religion, to deny God, and to abandon their hope of a future state, is marvellous indeed.

In conclusion, let me commend to you the words of Kant. "Criticism," said he, "alone can strike a blow at the root of Materialism, Fatalism, Atheism, Freethinking, Fanaticism, and Superstition, which are universally injurious."





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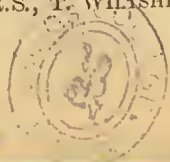
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